REMARKS

This is in reply to the Examiner's Official Action dated November 6, 2002. By this Amendment, the specification and claims 17-23 have been amended to more appropriately describe and claim the invention. Upon entry of the Amendment, claims 7, 9 and 17-23 will remain pending. The above amendment with the following remarks are submitted to be fully responsive to the Official Action. Reconsideration of this application in light of these remarks, and allowance of this application are respectfully requested.

I. Specification

Applicants have corrected minor typographical errors.

II. Rejection of Claims Under 35 U.S.C. § 102(b)

In paragraph 3 of the Official Action, the Examiner rejected claims 7 and 9 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,902,347 to Backman et al. (hereinafter, Backman).

Claim 7 recites a system that enables the georeferencing of a digital raster map, comprising: a processing platform for executing code capable of georeferencing a digital raster map; and a storage platform comprising cache memory for storing at least the digital raster map, the storage platform being coupled to the processing platform. Claim 9 recites a system that enables the georeferencing of a digital raster map, comprising: a processing platform for executing code capable of georeferencing a digital raster map; and a storage platform comprising non-cache volatile storage for storing at least the digital raster map, the storage platform being coupled to the processing platform.

Anticipation under 35 U.S.C. §102(b) requires that each and every claim

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limitation be disclosed by the applied reference. Backman does not teach each and every claim limitation of claims 7 and 9, and therefore, as a matter of law, cannot anticipate these claims. That is, Backman does not disclose a processor for executing code capable of georeferencing a digital raster map, as required by claims 7 and 9.

Georeferencing, as known by those skilled in the art, is the process of relating source coordinates to referenced coordinates. The processor, as described in Backman (and relied on by the Examiner), "retrieves georeferenced map data from a non-volatile storage system." (Backman at col. 2, lines 9-11.) Nowhere does this passage, or any other passage in Backman, mention the capability of the processor to execute code capable of georeferencing a digital raster map, as required by each of claims 7 and 9. Giving Backman its broadest possible interpretation, it is clear that the processor described in Backman may, at most, includes code capable of loading a previously georeferenced map and editing it to include points of interest, waypoints, trails or other pertinent data. (*see e.g.*, Id. at col. 2, lines 17-27.) Therefore, the rejection of independent claims 7 and 9 under 35 U.S.C. §102(b) as anticipated by Backman should be withdrawn.

In paragraph 6 of the Official Action, the Examiner rejected claims 17, 18 and 23 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,487,139 to Saylor et al. (hereinafter, Saylor).

Independent claim 17, as amended, recites an apparatus capable of georeferencing a raster map, comprising *inter alia*: means for providing for display of a first map in a first area of a display; and means for providing for display of a second map in a second area of the display. Independent claim 23, as amended, recites a

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system for georeferencing a digital raster map, comprising *inter alia*: a processing platform for executing code capable of georeferencing a digital raster map; and a storage platform coupled to the processing platform for storing at least a digital raster map, the storage map comprising facilities for . . . providing for display of a first map in a first area of a display; and facilities for providing for display of a second map in a second area of the display. Support for these amendments is found in Applicants' specification on page 8. In making reference to the specification set forth herein, it is to be understood that Applicants are in no way intending to limit the scope of the claims to the exemplary embodiments shown in the drawings and described in the specification. Rather, Applicants expressly affirm that they are entitled to have the claims interpreted broadly, to the maximum extent permitted by statute, regulation and applicable case law.

In contrast, Saylor discloses a method and system for generating a raster display having expandable graphic representations. In operation, a vector map is aligned and overlaid with a raster map (col. 5, lines 29-31.) The aligned maps provide an X, Y coordinate basis for locating specific addresses within the territory represented by the raster map (col. 6, lines 17-20.)

Saylor fails to disclose at least a capability to provide for display of a first map in a first area of a display; and to provide for display of a second map in a second area of the display, as required by each of claims 17 and 23. Even assuming *arguendo* that Saylor could be modified to display two maps in two different areas of a display, the modification would not be responsive to the functionality sought to be provided by Saylor (i.e., to locate specific addresses on hand-drawn raster maps using overlaid

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vector maps.) In other words, the entire purpose for overlaying the vector maps over the raster maps in Saylor is to overlay the X, Y coordinates relative to the vector database on the corresponding raster map. Removing the overlay feature undermines the purpose of the disclosed system and method.

Anticipation under 35 U.S.C. §102(b) requires that each and every claim limitation be disclosed by the applied reference. Saylor does not teach each and every claim limitation of claims 17 and 23 and therefore, as a matter of law, cannot anticipate these claims. That is, Saylor does not teach the process of providing for display of a first map in a first area of a display; and providing for display of a second map in a second area of the display, as required by each of claims 17 and 23.

Even though the cited reference fails to reach the teachings of Applicants' device, Applicants have amended claims 17 and 23 to more appropriately describe Applicants' invention. Applicants contend that the claims as amended, still patentably distinguish over the prior art. Therefore, the rejection of independent claims 17 and 23 under 35 U.S.C. §102(b) as anticipated by Saylor should be withdrawn. The rejection of dependent claim 18 should also be withdrawn as it depends on allowable subject matter as recited in independent claim 17 from which it depends.

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III. Rejection Of Claims Under 35 U.S.C. § 103(a)

In paragraph 10 of the Official Action, the Examiner rejected claims 19-21[1] under 35 U.S.C. § 103(a) as unpatentable over Saylor in view of "Accuracy Assessment of Mapping Products Produced from the Star-3i," to Li et al. (hereinafter, Li). According to the Examiner Saylor does not disclose executing a validation check of the georeferencing function pursuant to a transformation technique and he cites Li for allegedly teaching this feature.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be some reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure.

Here, the prior art references do not teach or suggest all the claim limitations. As stated above, Saylor does not teach the process of providing for display of a first map in a first area of a display; and providing for display of a second map in a second area of the display, as required by claims 19-21 through their dependence from claim 17. The Examiner does not argue, and Li does not teach, disclose or suggest the capability to provide for display of a first map in a first area of a display; and provide for display of a second map in a second area of the display. Therefore, Li fails to make up for the

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shortcomings of Saylor. Reconsideration and withdrawal of the rejection of claims 19-21 under 35 U.S.C. §103(a) is in order and respectfully requested.

The Examiner next rejects claim 22 under 35 U.S.C. § 103(a) as unpatentable over Saylor in view of U.S. Patent No. 5,596,494 to Kuo (hereinafter, Kuo). According to the Examiner, Saylor does not specifically disclose using at least [three] points [to compute the georeferencing function] pursuant to a general rotational linear transformation, and he cites Kuo for allegedly teaching this feature. The Examiner does not argue, and Kuo, likewise, does not make up for the deficiencies of Saylor. Noted above in regard to the rejection of claim 17 from which claim 22 indirectly depends. Therefore, claim 22 is not obvious over Saylor in view of Kuo.

In view of the foregoing, it is submitted that the cited prior art fails to teach or suggest the Applicant's claimed invention. Applicants respectfully assert that the present application is in condition for allowance and request a notice to that effect.

Attached hereto is a marked-up version of the changes made to the claims by this amendment. The attached page is captioned "**Version with markings to show changes made**." Deletions appear as normal text surrounded by [ ] and additions appear as underlined text.

If any extension of time under 37 C.F.R. § 1.136 is required to obtain entry of this response, and not requested by attachment, such extension is hereby requested. If there are any fees due under 37 C.F.R. § 1.16 or 1.17 that are not enclosed, including

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(...continued)

[1] Paragraph 10 of the Official Action incorrectly indicates that claims 19-20 are rejected.

any fees required for an extension of time under 37 C.F.R. § 1.136, please charge those fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: March 6, 2003

By: ______________________
Leonard Smith, Jr.
Reg. No. 45,118

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please amend the paragraph extending from page 2, line 16 to line 22, of the specification to read as follows:

> Also because vector maps are commonly drawn from a geographic data set describing the area shown, they are very easily, and generally inherently, georeferenced. Georeferencing is the process of relating source coordinates to referenced geographic coordinates[.], which are typically in standard latitude/longitude. An image or a vector file is georeferenced to be used within a mapping/geographic environment. In a vector map, the data from which the map is drawn will typically already include a geographic coordinate set.

Please amend the paragraph extending from page 10, line 5 to line 16, of the specification to read as follows:

> When four or more georeferencing point-pairs are determined, the general linear georeferencing functions are over-determined. This means that more than the required amount of information to compute the general linear georeferencing functions is available, but that it is not, in general, completely consistent. The system [use] <u>uses</u> the extra information contained in the additional georeferencing points to provide validation checks to protect against the possibility that some of the data points may be inaccurate **(step 430)**. Points that deviate excessively with respect to a

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calculated standard error are presumed to be inaccurate and are omitted from the calculation of the georeferencing functions. Note that as new [point] <u>points</u> are added, the system also rechecks points previously marked as inconsistent, to determine if those points should now be considered when recomputing the georeferencing functions.

Please amend the two paragraphs extending from page 10, line 22 to page 11, line 3, of the specification to read as follows:

The user may then proceed [o] <u>to</u> enter the next point-pair **(step 440)**[ ]. When the user is finished, the system stores the active georeferencing functions with the raster-map **(step [is]445)**. At this time, the raster map is considered fully georeferenced. When accessed at any future time, the system may simply retrieve the georeferencing functions, and apply them to find the latitude and longitude of any point on the raster map.

The process of determining [he] <u>the</u> georeferencing function set from a set of point-pairs is believed to be within the ability of one of ordinary skill in the art. The specific approach used by the system [an] <u>and</u> method of the preferred embodiment is discussed below.

Please amend the one line paragraph on page 11, line 15, of the specification to read as follows:

$$\hat{f}(x_i, y_i) = (Lon_i, Lat_i) \quad for\ i \in \mathrm{A} \qquad \underline{(1)}$$

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Please amend the paragraph extending from page 11, line 16 to line 24, of the specification to read as follows:

Once determined, $\hat{f}$ will [b] be the georeferencing function which is used to compute corresponding latitude and longitude values[,] (Lon, Lat) for any point[,] (x, y) on the bitmap. There are any number of possible ways to define the function that "comes closest" to making (1) true.["] We shall follow a "least squares" approach also known in mathematics as an L_2 approach. This approach seeks to find the function, $\hat{f}$, which minimizes the sum of the squared differences between the actual and the predicted values of latitude and longitude. In other words, from among all the functions $f \in F$, $\hat{f}$ is the one which minimizes:

Please amend the paragraph extending from page 12, line 1 to line 3, of the specification to read as follows:

Among various alternative methods for choosing the function $\hat{f}$ are choosing it so [t ht] that it minimizes the sum of absolute errors (rather than squared errors), or so that it minimizes the largest error. Other criteria are also possible.

Please amend the paragraph extending from page 12, line 11 to line 22, of the specification to read as follows:

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The General Linear Case: In the general linear case, we let F be the set of all possible linear transformations which map from (x, y) to (Lon, Lat). Thus,

$$\hat{f}(x,y)=\begin{bmatrix}\hat{a}_{11} & \hat{a}_{12}\\ \hat{a}_{21} & \hat{a}_{22}\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}+\begin{bmatrix}\hat{b}_1\\ \hat{b}_2\end{bmatrix} \qquad (3)$$

for some choice of parameters $\hat{a}_{11}$, $\hat{a}_{12}$, $\hat{a}_{21}$, $\hat{a}_{22}$, $\hat{b}_1$, and $\hat{b}_2$. If the region covered by the map to be georeferenced is not too large, then this family of functions will contain a suitable function[,] $\hat{f}$ whose total error is quite small. In the case where the map to be georeferenced covers a larger area than this, then the curvature of the earth must be taken into account and F is not a suitable family of functions. In such a case, nonlinear functions must be used as mentioned above. We shall not pursue that case further, since it is a straightforward extension of the procedures used in the linear case.

Please amend the paragraph extending from page 12, line 23 to page 13, line 2, of the specification to read as follows:

To find $\hat{f}$ we seek the parameters which minimize

$$SSE=\sum_{i\in A}\left(a_{11}x_i+a_{12}y_i+b_i-Lon_i\right)^2+\left(a_{21}x_i+a_{22}y_i+b_2-Lat_i\right)^2 . \qquad \underline{(4)}$$

The parameter values which minimize this expression are found by solving the following two independent systems of linear equations:

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Please amend the paragraph extending from page 13, line 8 to page 14, line 2, of the specification to read as follows:

These systems can be easily [solve] solved by well-known methods, such as Gaussian Elimination[,] or LU factorization. The solutions yield the desired values of $\hat{a}_{11}$, $\hat{a}_{12}$, $\hat{a}_{21}$, $\hat{a}_{22}$, $\hat{b}_1$, and $\hat{b}_2$. It should be noted that equations (5a) and (5b) do not have a unique solution unless three or more non-colinear points are contained in A. Generally speaking, then, it requires 3 points to choose a georeferencing function from the family of general linear transformations. When there are four points or more, it is possible to compute a standard deviation of errors using the formula:

$$s = \sqrt{\frac{\sum_{i \in \mathrm{A}} \left[\left(\hat{a}_{11} x_i + \hat{a}_{12} y_i + \hat{b}_1 - Lon_i \right)^2 + \left(\hat{a}_{21} x_i + \underline{a_{22} y_i} + \hat{b}_2 - Lat_i \right)^2 \right]}{n-3}} \quad (6)$$

where s is an estimator for the amount of error to be expected between actual and predicted latitude and longitude values.

Please amend the two paragraphs extending from page 15, line 15 to page 16, line 10, of the specification to read as follows:

The parameter values which minimize this expression are found by solving the following system of linear equations:

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$$\begin{bmatrix} n & 0 & \sum x_i & -\sum y_i \\ 0 & n & -\sum y_i & -\sum x_i \\ \sum_{i\in A} x_i & -\sum_{i\in A} y_i & \sum_{i\in A}\left(x_i^2+y_i^2\right) & 0 \\ -\sum_{i\in A} y_i & -\sum_{i\in A} x_i & 0 & \sum_{i\in A}\left(x_i^2+y_i^2\right)\end{bmatrix} \begin{bmatrix}\beta_1\\ \beta_2\\ \beta_3\\ \beta_4\end{bmatrix} = \begin{bmatrix}\gamma\sum_{i\in A} Lon_i \\ \sum_{i\in A} Lat_i \\ \gamma\sum_{i\in A} x_i Lon_i - \sum_{i\in A} y_i Lat_i \\ -\gamma\sum_{i\in A} y_i Lon_i - \sum_{i\in A} x_i Lat_i\end{bmatrix} \quad (8)$$

These systems can be easily solved by well-known methods, such as Gaussian Elimination[,] or LU factorization. The solutions yield the [desire] desired values of $\hat{\beta}_1$, [$\hat{\beta}_1$] $\hat{\beta}_2$, [$\hat{\beta}_1$] $\hat{\beta}_3$, and [$\hat{\beta}_1$] $\hat{\beta}_4$, which in turn yield the desired values for $\hat{a}_{11}$, $\hat{a}_{12}$, $\hat{a}_{21}$, $\hat{a}_{22}$, $\hat{b}_1$, and $\hat{b}_2$.

It should be noted that equation (8) does not have a unique solution unless two or [m re] more points are contained in A. Generally speaking, then it requires two points to determine a georeferencing function from the family of rotational linear transformations. When there are three points or more, it is possible to compute a standard deviation of error, s using the formula:

Please amend the paragraph extending from page 16, line 18 to page 17, line 4, of the specification to read as follows:

Automatic Error Detection and Handling

When individual points are being assigned x, y, Lon, and Lat values, there is always a potential for error. To reduce the risk of incorrect georeferencing resulting from such errors, certain error handling

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procedures are built into the georeferencing process. The fundamental concept is that of detecting a "bad" point and then removing it from the set of active points, A. Note that removing a bad point from A will not delete the information [associate,] associated with that point, but it will cause the georeferencing parameters to be completely uninfluenced by that point. We [o] do not wish to remove the point entirely, since it may be determined at a later stage of the georeferencing, that the point was not really bad at all, and should be[-] used in the georeferencing calculation. This will be clarified shortly.

Please amend the paragraph extending from page 17, line 6 to line 17, of the specification to read as follows:

Detecting Bad Points The following steps outline the bad point detection process using the general linear transform approach to georeferencing.

1. Begin by placing all existing points into the active set, A.

2. If there are fewer than five active points then you are done[,]. Otherwise, for each of the currently active points in turn, move it (call it point k for the sake of convenience) temporarily out of the active set, and then calculate the resulting inverse georeferencing function (call it $\hat{g}^{(k)}$) and its corresponding SSE_k. Also, calculate the difference between the predicted value and the actual value $\delta_k = \left\| [\hat{g}^{(k)}] \underline{\hat{g}^{(k)}}(Lon_k, Lat_k) - (x_k, y_k) \right\|$.

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Make a note of the values, $\delta_k and \delta_k / SSE_k$. Return point k to the active set [(]and move on to the next value of k.

Please amend the paragraph extending from page 18, line 2 to line 13, of the specification to read as follows:

There are several things to note about this procedure. One is that it [allowing] allows the value of c_1 and c_2 to change with the number of active points, [makes] making it possible for the georeferencing system and method to utilize points which it might originally determine bad or inconsistent after a large enough sample of points has been gathered to make it clear that a lesser level of accuracy is all that can be achieved on this map. Another observation is that by using this procedure it is impossible to reduce the number of active points [down] to less than four (unless you started with less than 4 in which case this procedure does not apply at all). This scheme means that as each new point is added, all points determined so far are considered, even those [which] that had previously been marked bad. Thus early "misjudgments" on the part of the system can be corrected later, in light of new point information.

Please amend the paragraph extending from page 18, line 23 to page 19, line 16, of the specification to read as follows:

A specific example of the operation and application of the preferred georeferencing method may be shown with reference to the "Flood Zone Determination" business. The Federal Emergency Management Agency

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(FEMA) publishes a library of tens of thousands of paper maps showing various types of flood zones and their locations in the United States. A flood zone determination on a property is frequently done in the following way:

1. The address of the property is examined, and the location of the property is determined (perhaps through the use of a geocoding system, or [b] by examining an available street map).

2. A map analyst attempts to determine which of the many thousands of FEMA flood maps will contain this property.

3. The map analyst goes to a map storage area and retrieves the desired map, often examining several maps before making a final selection.

4. Having retrieved the paper map, the map analyst next determines where, precisely, the property is located on the map.

5. Finally, the map analyst examines flood zone notations on the map at the property's location in order to determine its flood-zone status.

Please amend the paragraph extending from page 20, line 5 to line 19, of the specification to read as follows:

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Using georeferenced flood map raster images, steps 2 and 4 above, are replaced by:

2. A computer system combines the pre-designated outlines of the raster map and the georeferencing information to obtain a polygon expressed in terms of latitude and longitude that outlines the region included in each flood map. Then the system determines which of the polygons contain the address in question, which is done using a "point-in-polygon" algorithm. At the conclusion of this process, the computer system has identified a map panel (or perhaps a small number of map panels) that contains the address.

4. Since the latitude and longitude of the property are known (by virtue of a geocoding phase), the computer system can use the georeferencing of the map panels to locate the property on each of the panels found above, thus largely eliminating any need for [he] <u>the</u> map analyst to scan the flood map for the address location<u>.</u>

<u>IN THE CLAIMS:</u>

Please amend claims 17-23, as follows:

17. (Twice Amended) [A data signal comprising a data structure] <u>An apparatus</u> that is capable of georeferencing a raster map, by:

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means for providing for display of a first map in a first area of a display;

[and a] means for providing for display of a second map in a second area of the display, the first map being a digital raster map, and the second map being a previously georeferenced map, the first and second maps covering substantially the same geographic area when they are displayed;

means for receiving an entry identifying a first point pair, one point being on each map;

means for receiving an entry identifying a second point pair, one point being on each map, the corresponding points of the point pairs having approximately the same geographic location on each map;

means for assigning to the points on the first map a longitude coordinate and a latitude coordinate which is identical to the longitude coordinate and latitude coordinate of their corresponding points on the second map[:]; and

means for computing a georeferencing function based on the pixel coordinates of the points of the first point pair on the first map and the geographic coordinates of the points of the second point pair on the second map.

18. (Twice Amended) [A data signal] An apparatus as in [Claim] claim 17, wherein[:]

[as a result of the receiving steps,] the points of the point pairs comprise marks on the first map at respective locations and marks on the second map at corresponding [location] locations.

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19. (Twice Amended) [A data signal] <u>An apparatus</u> as in [Claim] <u>claim</u> 17, wherein:

more than two point pairs are identified and are used to compute the georeferencing function pursuant to a transformation technique, and

which further comprises <u>means for</u> executing a validation check of the georeferencing function pursuant to a standard deviation technique.

20. (Twice Amended) [A data signal] <u>An apparatus</u> as in [Claim] <u>claim</u> 19 wherein the [data structure] <u>means for executing a validation check</u> is <u>further</u> capable of rejecting a point pair when the point pair deviates a predetermined amount from a predetermined standard error.

21. (Amended) [A data signal] <u>An apparatus</u> as in [Claim] <u>claim</u> 19, wherein:

at least four points are identified and are used to compute the georeferencing function pursuant to a general linear transformation.

22. (Amended) [A data signal] <u>An apparatus</u> as in [Claim] <u>claim</u> 19, wherein:

at least three points are identified and are used to compute the georeferencing function pursuant to a general rotational linear transformation.

23. (Amended) A system for georeferencing a digital raster map, comprising<u>:</u>

a processing platform for executing code capable of georeferencing a digital raster map; and

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a storage platform coupled to the processing platform for storing at least a digital raster map, the storage map comprising

facilities for providing for display of a first map in a first area of a display; [and a]

facilities for providing for display of a second map in a second area of the display, the first map being a digital raster map, and the second map being a previously georeferenced map, the first and second maps covering substantially the same geographic area when they are displayed;

facilities for receiving an entry identifying a first point pair, one point being on each map;

facilities for receiving an entry identifying a second point pair, one point being on each map, the corresponding points of the point pairs having approximately the same geographic location on each map;

facilities for assigning to the points on the first map a longitude coordinate and a latitude coordinate which is identical to the longitude coordinate and latitude coordinate of their corresponding points on the second map; and

facilities for computing a georeferencing function based on the pixel coordinates of the points of the first point pair on the first map and the geographic coordinates of the points of the second point pair on the second map.

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